

## ORIGINAL ARTICLE

# Video-assisted hepatic abscess debridement

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## Abstract

**Background:** Pyogenic liver abscesses are currently treated by either percutaneous computer tomography (CT)-guided drainage or by laparoscopic and a conventional liver resection when conservative treatment fails but may be associated with substantial morbidity and mortality.

**Methods:** A minimally invasive technique involving debridement of right liver abscesses was employed using a minimally invasive video-assisted hepatic abscess debridement (VAHD) after unsuccessful percutaneous CT-guided drainage. Clinical data, complication rates and outcomes of patients were recorded retrospectively.

**Results:** Between 2011 and 2014, VAHD was performed on 10 patients at two centres with no observed recurrence of a liver abscess. The median age of the patients was 57 years (range 42–78) with a median pre-operative size of a liver abscess of 78 mm (range 40–115). The median operation time was 47 min (range 23–75), and the median postoperative hospital stay was 9 days (range 7–69). One patient developed a subcutaneous abscess that required further surgery. No patient died, and there were no major complications related to the VAHD.

**Conclusions:** Video-assisted hepatic abscess debridement is a feasible technique that shows promising results for the treatment of a recurrent right liver abscess.

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## Introduction

Liver abscesses are common, and treatment is often challenging. Advanced imaging techniques may enable ready identification of small lesions in their initial stages. Aggressive treatments have given way to minimally invasive procedures such as ultrasound (US) or computer tomographic (CT)-guided percutaneous or laparoscopic drainage.<sup>1,2</sup> Percutaneous management combined with systemic antibiotics is effective and safe and resolves most liver abscesses. However, a small proportion of patients may require surgical drainage.<sup>3</sup>

A similar problem exists for necrotizing pancreatitis, in which the video-assisted retroperitoneal debridement (VARD) procedure provides an excellent alternative to necrosectomy by laparotomy or CT-guided percutaneous drainage in the treatment of infected necrotizing pancreatitis (INP). Although pancreatic necrosis and hepatic abscesses are very different pathological processes, the minimally invasive VARD procedure was adopted

for the therapy of persistent or therapy refractory liver abscesses in this study.<sup>4</sup>

## Patients and methods

### Patient information

Informed consent was obtained from patients with an intraparenchymal right-sided liver abscess and were operated at the Department of General, Visceral and Transplantation Surgery, RWTH Aachen University Hospital, Germany and at the Department of Surgery, Maastricht University Medical Centre, The Netherlands. Basic demographic data (age, gender, medical history including previous operations, previous percutaneous drainage, the size of the liver abscess, operation time, bacteriology and duration of hospital stay) were recorded.

### Management protocol

Patients were selected for video-assisted hepatic abscess debridement (VAHD) on the basis of having persistent clinical

and radiological features of a liver abscess. In both centres, a liver abscess was normally managed by antibiotic therapy based on culture sensitivities of blood or pus. Antibiotic therapy alone was normally employed for patients with small, non-accessible abscess formation. Percutaneous drainage was employed for patients with accessible abscesses. Only patients whose abscess had not resolved with at least one percutaneous radiological drainage procedure were considered for VAHD. Antibiotic therapy was normally continued for at least 7 days. Monitoring of patients was normally undertaken by serial computer tomography (CT). Resolution of a liver abscess was based on control CT, clinical and laboratory parameters.

### Technique of VAHD procedure

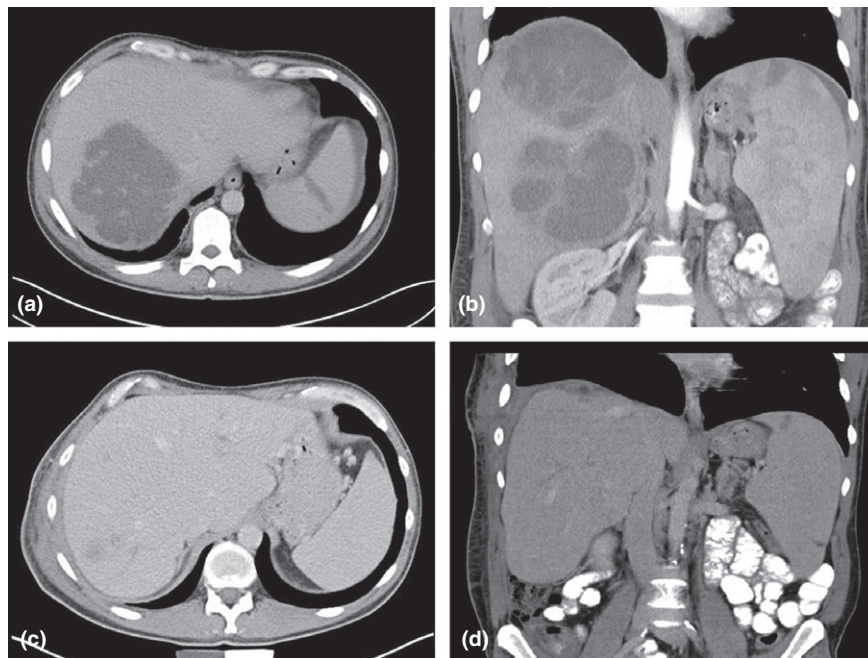
Pre-operatively a CT-guided percutaneous drainage was placed within the liver abscess to assist operative guidance (Fig. 1). Placement of the percutaneous drainage was planned individually, and CT-guided drainage was performed. The drain was placed radiologically as posterior as possible on the flank. Video-assisted retroperitoneal debridement of the liver abscess was performed under general anaesthesia. The patient was placed in a left lateral position with the right hand over the head (Fig. 2). A spindle-shaped excision was performed at the site of percutaneous drainage that was used as a guide to reach the abscess cavity from which purulent material was aspirated using a laparoscopic suction device. Visualization of the abscess cavity was achieved using a 10-mm 0 degree Videoscope (Storz, Tuttlingen, Germany) and the outer necrotic abscess

capsule was removed carefully with a long grasping forceps. Further debridement of necrotic liver tissue was performed carefully using 5-mm laparoscopic instruments.

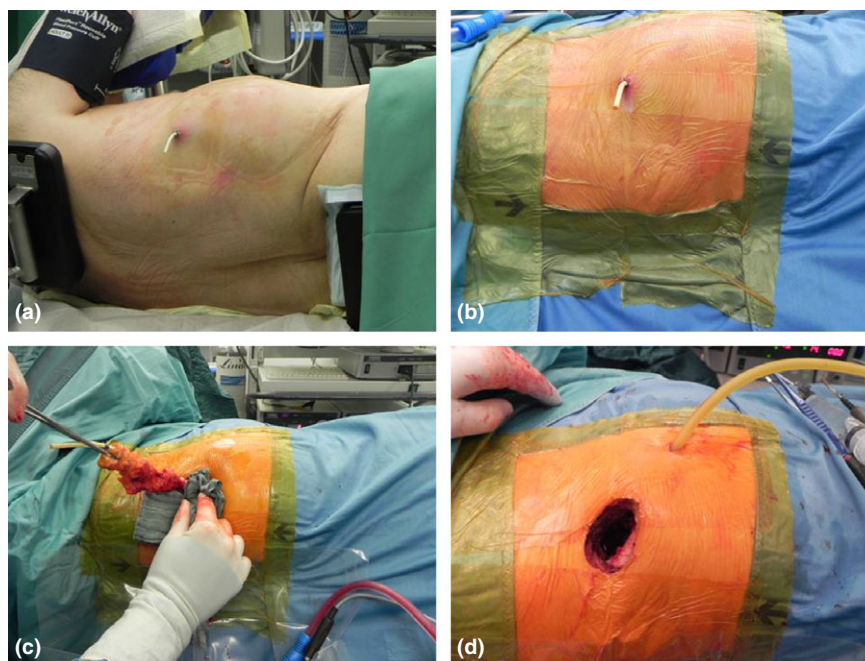
After performing the debridement, the cavity was irrigated with sterile saline until the suction-fluid became clear. Haemostasis was secured using a bipolar or argon laser. The abscess cavity was drained by a 16°F-gauge irrigation suction drainage sutured to the skin. Continuous post-operative lavage with 2 l of normal saline per day was performed until serous quality of lavage fluid was observed. Drainage was discontinued after that and secondary wound healing intended.

### Results

Between December 2011 and October 2013, 10 patients had undergone a minimum of one unsuccessful percutaneous CT-guided liver drainage before VAHD was attempted (Table 1). The median age of the patients (seven male) was 57 years (range 42–78). The pre-operative median size of the liver abscess was 78 mm (range 40–115) and the median number of unsuccessful percutaneous CT-guided liver drainage before VAHD procedure was 2 (range 1–5). The median operation time was 47 min (range 23–75). No recurrent liver abscess occurred, and no major post-operative complication was detected. In one patient, a subcutaneous abscess required surgical intervention. The hospital stay ranged from 7 to 69 days with a median stay of 9 days. The mean duration of follow-up was 3 months.



**Figure 1** (a and b) demonstrate a typical right hepatic abscess and a follow-up computed tomography (CT) at 3 months after video-assisted hepatic abscess debridement (VAHD) (c, d)



**Figure 2** Pre-operative situation with the guidance drainage in the right upper flank (a); pre-operative situation with the guidance drainage in the right upper flank after disinfection (b); spindle-shaped excision around the guidance drainage (c). Excised liver abscess after debridement with a lavage-suction 16 F-drain sutured to the skin (d)

**Table 1** Patients' details

	Gender	Age	Diagnosis	Number of CT-guided drainage before VAHD	Size of liver abscess (mm)	Operation time (min)	Complications
Patient 1	Female	78	Liver resection for gallbladder carcinoma	1	80	23	None
Patient 2	Male	42	Chronic pancreatitis	2	76	49	Post-operative subcutaneous abscess
Patient 3	Male	61	Pylorus preserving pancreaticoduodenectomy for cholangiocarcinoma	2	40	37	None
Patient 4	Male	52	Complicated course after cholecystectomy	2	85	28	None
Patient 5	Male	40	Amoebiasis	3	71	65	None
Patient 6	Female	70	Trisecton ectomy due to Klatskin tumor	4	115	43	None
Patient 7	Male	72	Pylorus preserving pancreaticoduodenectomy for pancreatic carcinoma	5	85	59	None
Patient 8	Female	44	Liver resection for adenoma	1	93	45	None
Patient 9	Male	45	Superior mesenteric artery stenosis for aortal reconstruction	1	63	75	None
Patient 10	Male	64	Pylorus preserving pancreaticoduodenectomy for pancreatic carcinoma	1	52	53	None

Microbiological examination of abscess material demonstrated a variety of organisms including *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, *Proteus mirabilis*, *Enterococcus faecium*, *Streptococcus pyogenes*, *Fusobacterium nucleatum*, *Escherichia coli*, *Streptococcus constellatus*, *Klebsiella oxytoca*, *Enterococcus faecalis*, vancomycin-resistant enterococcus (VRE) and methicillin-resistant *staphylococcus aureus* (MRSA).

## Discussion

Of the different methods available in the treatment of the pyogenic liver abscesses, singular antibiotic therapy is the first choice of treatment for small multiple abscesses.<sup>5</sup> Percutaneous drainage has largely replaced surgical drainage as a first-line treatment with a success rate of 70–90% for solitary and unilocular abscesses.<sup>6</sup>

Failure of this therapy strategy include catheter obstruction by pus, retained intra-abscess debris, the presence of multiloculated abscesses, immunocompromised patients, inappropriate catheter placement or premature removal of drains.<sup>7</sup> Retained debris or adhesive content of the abscess may occur in patients with secondarily infected, necrotic segments of the liver and evacuation of these areas can be problematic. A small proportion of patients with a liver abscess may, therefore, require surgical drainage. In the report of Zerem *et al.*,<sup>3</sup> percutaneous needle aspiration was performed in 116 patients, with 70 later requiring percutaneous catheter drainage owing to abscess recurrence. In 148 patients, percutaneous catheter drainage had been performed initially but was required twice or more in 63 patients. Percutaneous treatment was the definitive successful treatment in 230 of 264 patients (87%) but 20 patients (8%) required surgery.<sup>3</sup> Up until now, there have been no randomized controlled trials to compare percutaneous to surgical drainage techniques. The failure rate can be expected to be higher in the percutaneous group owing to the smaller caliber drainage of the catheters, as well as the insufficiency of necrosectomy and debridement of necrotic liver areas within the abscess.<sup>7</sup> If percutaneous drainage fails, all surgical accessible liver abscesses are candidates for laparoscopic intervention.<sup>1,8</sup> However, when previous abdominal surgery has been performed, a laparoscopic approach might not be the preferred choice.

In this study, the VARD was adopted for recurrent liver abscesses in patients in which a laparoscopic approach did not seem to be favourable. The VARD procedure has been described as a safe and efficient procedure for infected pancreatic walled-off necrosis with low mortality and complication rates.<sup>9</sup> As with VARD, the VAHD has been associated with low complication rates. Only one patient required reoperation owing to a recurrent subcutaneous abscess.

The VAHD procedure seems to be a feasible procedure with a manageable operation time. The present approach with video examination allows visualization of the cavity and irrigation until the suction fluid is clear. It also allows identification of necrotic liver areas and offers the possibility of performing proper debridement. The appropriate time point for this intervention is most probably not at the beginning of abscess formation as an established pyogenic membrane keeps the risk for injury of liver vasculature or the biliary tree to a minimum.

This report represents only a description of the feasibility of the technique. Further large randomized trials would be required to prove the superiority of VAHD over laparoscopic or open drainage in patients with recurrent liver abscesses in which percutaneous CT-guided drainage fails.

## Author contributions

The contributions of each author in preparing the manuscript are as follows: Study conception and design: C.D.K., M.B., U.P.N., R.M.D., C.H.D., K.J.; Acquisition of data: C.D.K., M.B., K.J.; Analysis and interpretation of data: C.D.K., M.B., U.P.N., R.M.D., C.H.D., K.J.; Drafting of manuscript: C.D.K., M.B., U.P.N., R.M.D., C.H.D., K.J.; Critical revision of manuscript: C.D.K., M.B., R.M.D., C.H.D., U.P.N., K.J.

## Conflict of interest

The authors declare that they have no conflict of interest.

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